WESTON • SPER

River Center, 111 North Canal Street, 8th Floor, Suite 855,
Chicago, IL 60606 • (312) 993-1067

TECHNICAL ASSISTANCE TEAM FOR EMERGENCY RESPONSE REMOVAL AND PREVENTION
EPA CONTRACT 68-01-7367

Mr. Steven J. Faryan
Deputy Project Officer
Emergency Response Section
Western Response Unit
U.S. Environmental Protection Agency
11th Floor
230 South Dearborn Street
Chicago, Illinois 60604

September 30, 1988

TAT-05-G2-00670

Re: Better Brite Chrome, DePere, Wisconsin
TDD# 5-8804-14

Dear Mr. Faryan:

The U.S. Environmental Protection Agency (U.S. EPA) tasked the Technical Assistance Team (TAT) to develop a treatment system for removing chromium from the ground water at the Better Brite Plating Company (Better Brite Chrome) site in DePere, Wisconsin. Several alternative treatment options were considered for treating the ground water including reverse osmosis, ion exchange, and chemical treatment. A variance that would permit discharging into the sanitary sewer was also considered.

Based on the options evaluated, the TAT recommends installing the chemical treatment system along with an insulated steel sided building at the Better Brite Chrome site. Prior to purchasing the treatment system, a written commitment to maintain the system should be obtained from the Wisconsin Department of Natural Resources or the City of DePere. The U.S. EPA should provide the financing to maintain the system for the first year of operation with the state and local municipalities providing the funding thereafter. In addition to the treatment system, the on-site pond should be drained, the contaminated soils scraped, and the site brought to grade with top soil and seeded.

The cost of the aforementioned treatment system and site work would be $103,000.00 with an annual maintenance cost of $20,000.00. The total estimated cost including TAT and U.S. EPA cost is $199,000.00.

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Should you have any questions or require additional information, please feel free to contact us.

Very truly yours,

ROY F. WESTON, INC.

Richard H. Mehl Jr.

Richard H. Mehl Jr.
Environmental Engineer

Sally Matz

FOR Scott Springer
Technical Assistance Team
Leader, Region V

RHM/bjh

CHROME TREATMENT SYSTEM

FOR

BETTER BRITE PLATING

DEPERE, WISCONSIN

Prepared For:

U.S. Environmental Protection Agency
Region V
230 South Dearborn Street
Chicago, Illinois

CONTRACT NO. 68-01-7367

TAT-05-G2-00670

TDD NO. 5-8804-14

Prepared By:

WESTON-SPER
Technical Assistance Team
Region V

September 1988

TABLE OF CONTENTS

1.0 INTRODUCTION

The U.S. Environmental Protection Agency (U.S. EPA) tasked the Technical Assistance Team (TAT) to develop a treatment system for removing chromium from the ground water at the Better Brite Plating Company (Better Brite Chrome) site in DePere, Wisconsin (Figure 1). The treatment system must be capable of treating chromium contaminated ground water with concentrations up to 1,200 parts per million (ppm) at a rate of 2,000 gallons per day (gpd); the effluent must meet the City of DePere pretreatment standard of 7 ppm. The system should be automated to eliminate or limit operator assistance and be contained in a heated building for protection. The U.S. EPA will finance the operation and maintenance of the system for the first year, with the local and/or state agencies financing the system thereafter. The system should remain operational until the chromium concentration in the ground water decreases to 7 ppm.

2.0 SITE LOCATION AND HISTORY

Better Brite Chrome is located at 519 Lande Street in DePere, Wisconsin (population 14,892). The site, which covers 1.5 acres, is situated one-quarter mile west of the Fox River in a primarily residential area. It is bordered by Lande Street to the north, residential homes to the south and west, and railroad tracks and residences to the east (Figure 2). A small pond that collects site runoff is located on the east side of the site. A building that previously housed in-ground storage tanks also remains on-site.

Better Brite Chrome began its plating operation in late 1970 and operated until October 1985, when the company filed for bankruptcy. The source of ground water contamination is attributed to several reported spills during the course of operations and from several leaking in-ground plating liquid storage tanks. According to John Zenner, the most recent owner of the facility, between 20,000 and 60,000 gallons of plating solution may have leaked from the in-ground storage tanks during the seven years of plating operation.

3.0 TREATMENT APPROACHES

Three alternative technologies were considered for treating the chromium contaminated ground water at the Better Brite Chrome site: reverse osmosis, ion exchange, and chemical treatment. In addition, a U.S. EPA Resource Conservation and Recovery Act (RCRA) variance was considered. These options will be explored in greater detail in the following sections.

REVERSE OSMOSIS

A reverse osmosis (RO) unit purifies ground water by forcing contaminated water through a semi-permeable membrane under

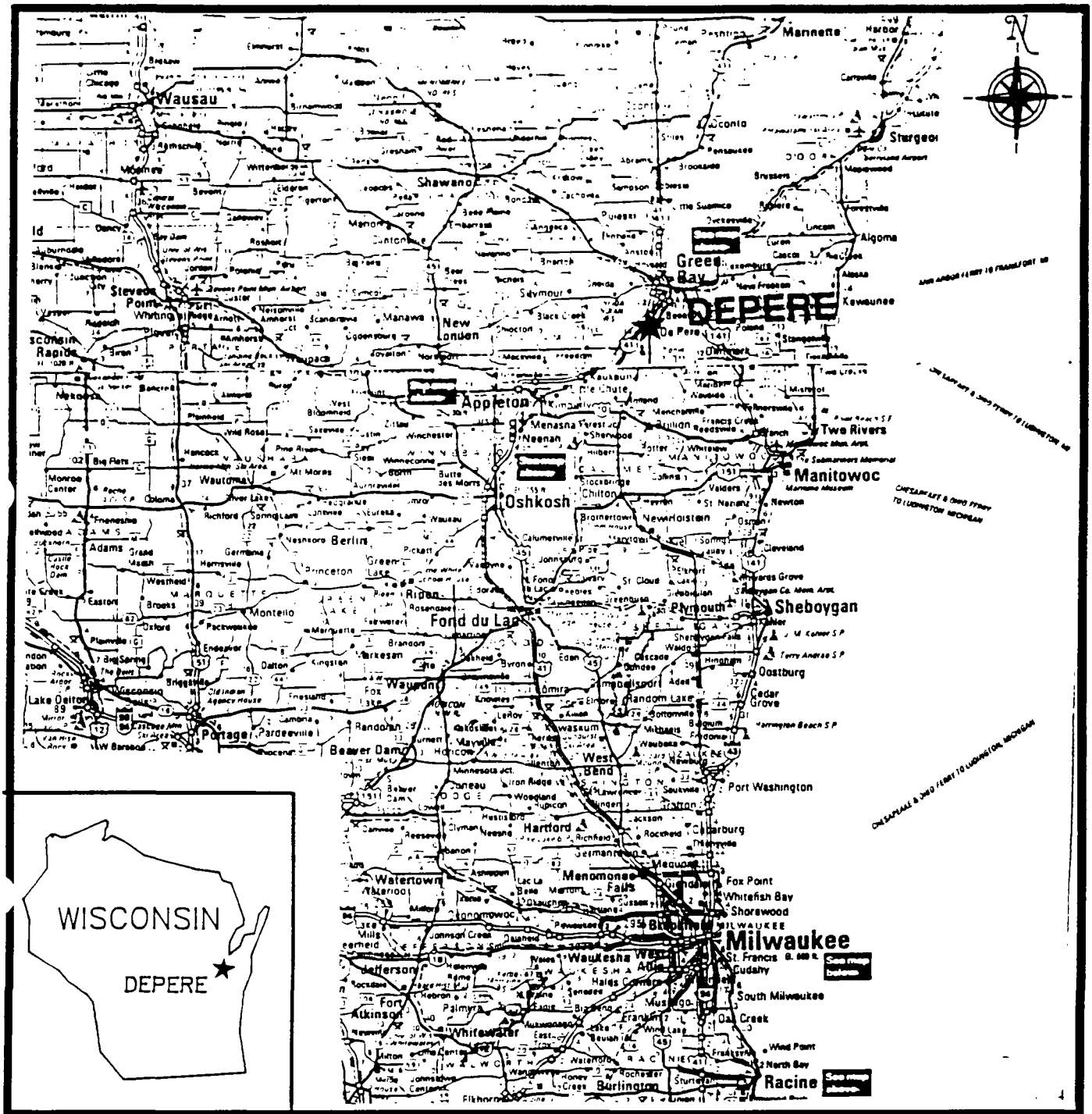

FIGURE 1

SITE LOCATION MAP

BETTER BRITE CHROME

DEPERE, WISCONSIN

NOT TO SCALE

WESTON

MANAGERS DESIGNERS/CONSULTANTS

DRAWN BY	DATE	PCS #
RHM	9-30-88	1493
APPROVED BY	DATE	TDD #
L. AXE	9-30-88	5-8804-14

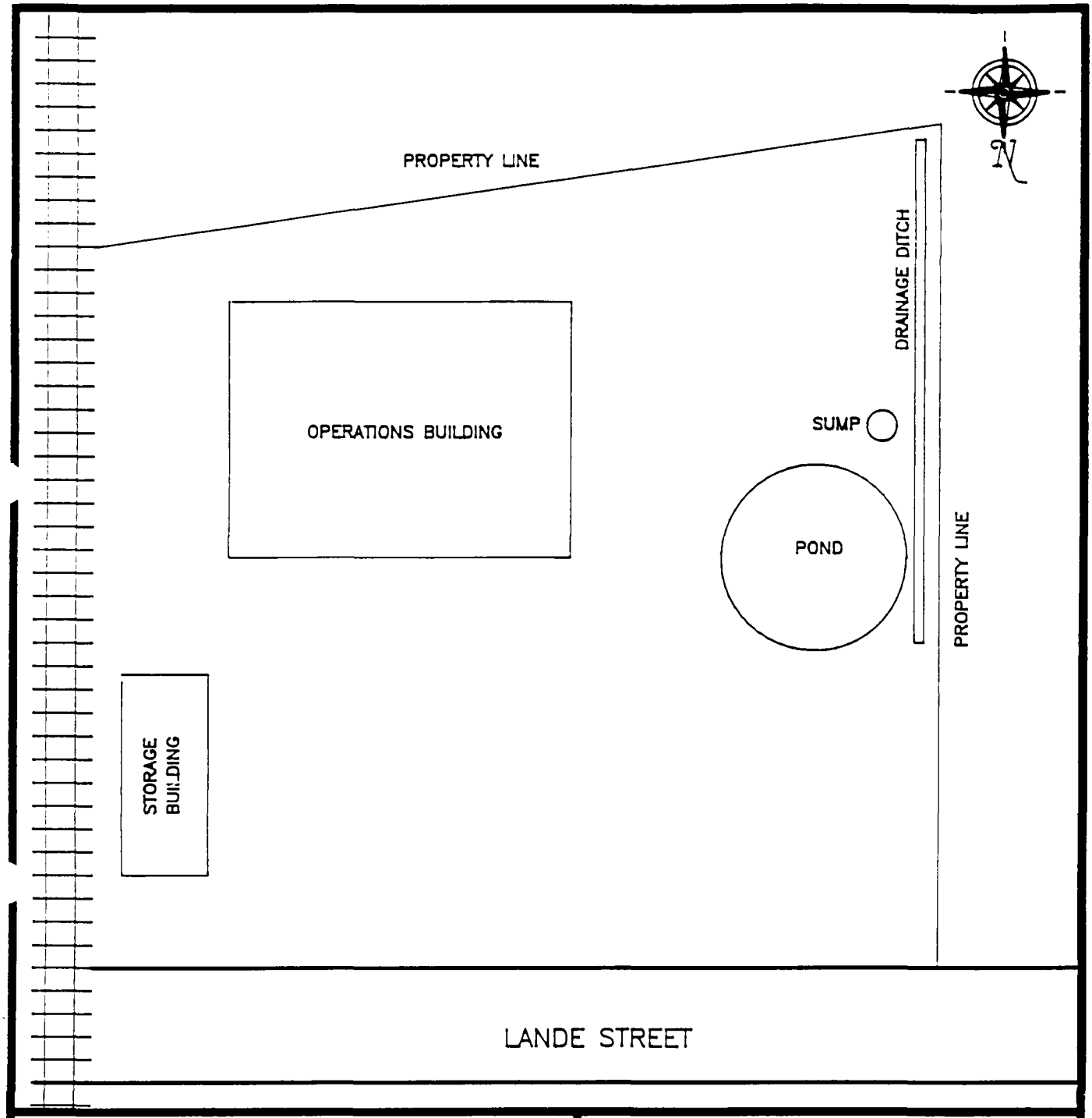

FIGURE 2
SITE MAP
BETTER BRITE CHROME
DEPERE, WISCONSIN

NOT TO SCALE

WESTON
MANAGERS DESIGNERS/CONSULTANTS

DRAWN BY RHM	DATE 9-30-88	PCS # 1493
APPROVED BY L. AXE	DATE 9-30-88	TDD # 5-8804-14

high pressure. Under ideal conditions this system could remove 80 to 90 percent of the total chromium; however, to reduce the chromium concentration to 7 ppm at least a 99 percent removal efficiency is required. Another potential problem is that as the chromium concentrates on the membrane, it can oxidize the membrane, requiring frequent membrane replacement. Also, the RO unit would require extensive pretreatment to remove any suspended solids such as calcium. For these reasons treating the chrome-contaminated ground water with a RO unit would be an impractical alternative and therefore will not be considered.

ION EXCHANGE

Ion exchange treatment involves exchanging an ion possessing a high ionic affinity with an ion possessing a low ionic affinity. In such a treatment process, the contaminated water passes across resins having exchangeable ions. The ions removed from the water attach to the resins and are exchanged for ions having a a lower affinity to the resin.

The exchange reaction is reversible and is dependent upon the concentration of the contaminant involved. Where it is necessary to remove both cations (positively charged ions) and anions (negatively charged ions), it will be necessary to have a two resin system.

Ion exchange is an effective method for removing heavy metals from water with contaminant concentrations of up to 1,500 mg/l. Higher concentrations of contaminants will result in rapid depletion of the resins and high regeneration costs; however, with lower contaminant concentrations, ion exchange is a viable treatment option. Ion exchange can also be used to recover chemicals for reuse or resale.

Recent laboratory analyses have indicated that the total chromium in the ground water at the Better Brite Chrome site is comprised of approximately 90 percent hexavalent chromium and 10 percent trivalent chromium, thus a two resin system will be required.

While the ion exchange system will be effective in removing the chromium from the ground water, the regenerant from the regeneration cycle must be treated. It is estimated that for every 1,000 gallons treated, 400 gallons of regenerant is produced. The regenerant will consist of an acidified brine with chromium. This excessive generation of waste material would result in cost prohibitive disposal costs. This is shown in detail in the cost analysis section. In

addition, there is no use for the treated effluent nor will there be a need to recover the chromium. Therefore, for the Better Brite Chrome site, the economic benefits of ion exchange are diminished.

CHEMICAL TREATMENT

Chemical treatment represents a proven and effective method for removing chromium from ground water. Chemical treatment involves reducing hexavalent chromium to its trivalent state using sodium bisulfate or ferric chloride. The remaining trivalent chromium is precipitated out at a high pH and flocculated with an inorganic coagulant such as lime or alum. The flocs then separate out in a clarifying tank. The treated effluent can then be discharged to a sanitary sewer. The remaining sludge is thickened with polymers, dried and disposed of in an appropriate landfill.

Advantages of chemical treatment include its proven effectiveness, minimal safety and health hazards, ease of operation, and relatively low disposal costs. The disadvantages of the system include high capital costs, bulky equipment, and required operator assistance.

Two companies were contacted for varied approaches on treating the contaminated ground water using chemical treatment: Aqua Treat, Inc. (ATI) of Chicago Heights, Illinois, and TSR Engineering (TSR) of Broadview, Illinois.

ATI proposes using a 25 gallon per minute (gpm) continuous flow wastewater treatment system that utilizes the existing collection sump and 25 gpm pump (Figure 3). The proposed system would chemically treat the chromium contaminated ground water with ferric chloride, and consist of a series of mixing, flocculation, clarifying and sludge thickening tanks. The waste sludge would be dried to a 50 percent solids concentration on a sludge drying conveyor with a hot water boiler. The system effluent would be screened with a polyethylene cloth screen before being discharged into the sanitary sewer. A backup set of pH sensing probes in the mix/reaction tanks would be included to compensate for the lack of a full time operator.

TSR proposes using a similar system except that the ground water will be chemically treated with sodium metabisulfate instead of ferric chloride. The TSR system uses a filter press to dry the sludge instead of a boiler, and a mixed media filter will filter the effluent instead of a polyethylene cloth filter. TSR recommends that the majority of the instrumentation be duplicated. The duplication of the instrumentation and chemical feed systems would insure proper operation of the system in the event of an equipment

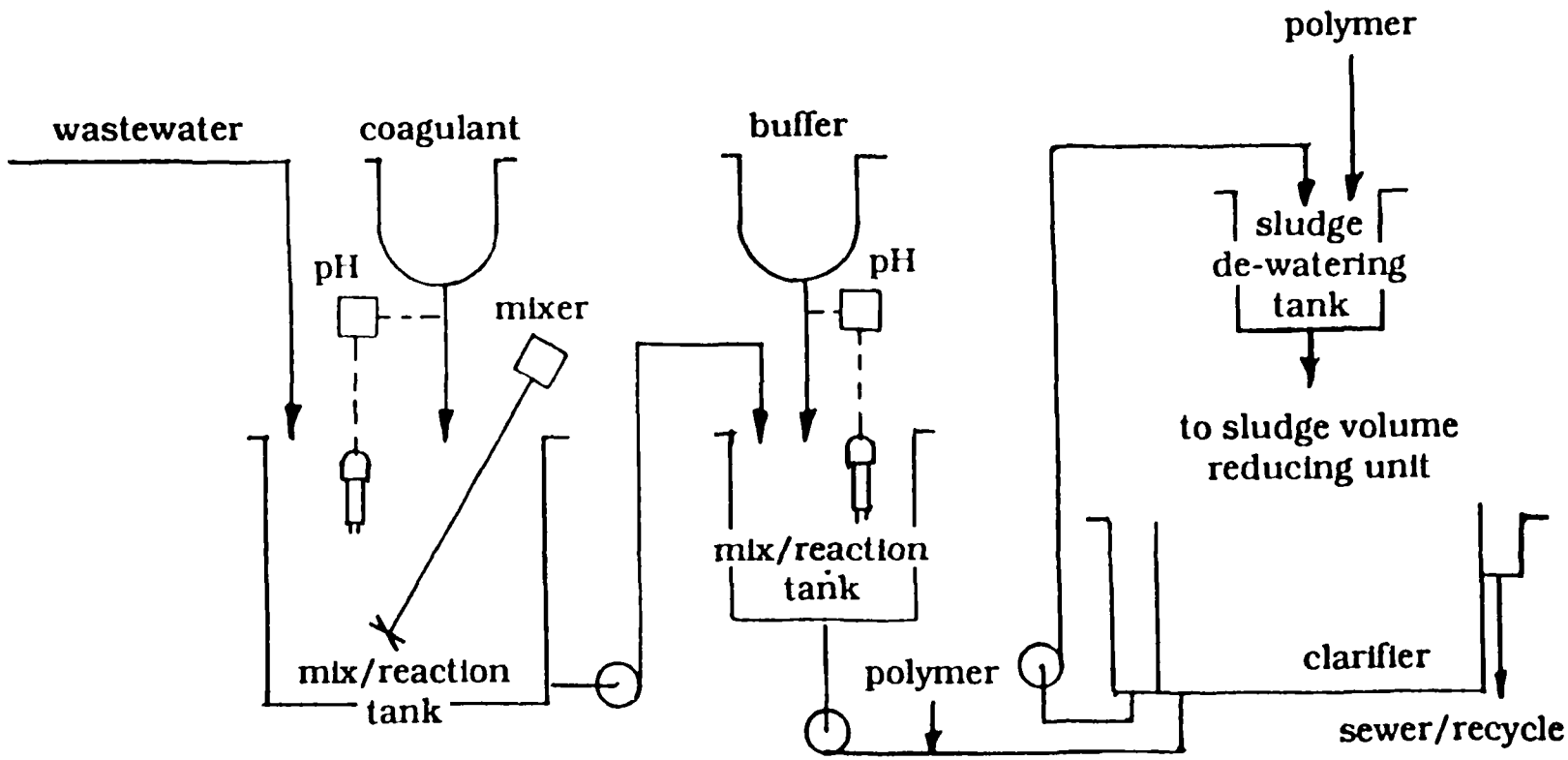

FIGURE 3

SYSTEM FLOWCHART

BETTER BRITE CHROME

DEPERE, WISCONSIN

NOT TO SCALE

WESTON MANAGERS DESIGNERS/CONSULTANTS

DRAWN BY RHM	DATE 9-30-88	PCS # 1493
APPROVED BY L. AXE	DATE 9-30-88	TDD # 5-8804-14

failure. Both systems would be equipped with alarm systems and automatic shutoffs that notify the appropriate personnel of problems, such as high water level and chemical deficiencies. Also both systems require an operator to occasionally refill the chemical holding tanks and perform routine maintenance. The TSR system also requires an operator to load and run the filter press twice a week.

RCRA VARIANCE

A U.S. EPA RCRA variance that would allow chromium contaminated ground water above the City of DePere pretreatment standard of 7 ppm to be discharged into the sanitary sewer was evaluated.

If a variance was granted then the drain and pump system that is currently operating at Better Brite Chrome could continue to discharge into the DePere sanitary system.

The advantages of a variance include no additional capital costs and limited routine maintenance. Also according to David Benner, the City of DePere Wastewater Treatment Plant Manager, the chromium discharged from the Better Brite Chrome site does not have an impact on the five million gpd treatment plant.

Although a variance is a viable option, it does not comply with the directions set forth under the Superfund Amendment Reauthorization Act of 1986, and the Comprehensive Environmental Response, Compensation, and Liability Act of 1980.

4.0 RECOMMENDATIONS

After evaluating the options presented in this report, the TAT recommends that a chemical treatment system be implemented at the Better Brite Chrome site. Of the two chemical treatment systems considered, the system proposed by ATI appears to be the better option. Compared to the TSR system, the ATI system has a lower capital cost, will require less operator assistance and is capable of drying the waste sludge to a 50 percent weight reduction. However, before the system is purchased, a tour of existing operating systems should be conducted. A list of companies currently using the ATI system is included in Attachment A.

Prior to implementing a treatment system, the U.S. EPA should obtain a written commitment from the Wisconsin Department of Natural Resources or the City of DePere to maintain the treatment system. The U.S. EPA should provide the financing to maintain the system for the first year of operation, with the local and/or state agencies providing the funding thereafter.

In order to protect the treatment system from the weather, an insulated steel sided building should be constructed. The building should be capable of maintaining an inside temperature of 60° Fahrenheit in the cold weather months. In addition to the chemical treatment system, the on-site pond should be drained, and the contaminated soils scraped and disposed of at a RCRA approved landfill. To verify that the surface contamination has been removed 10 soil samples should be collected and analyzed for hazardous substance list metals and total cyanide. To prevent erosion the site should be brought to grade with topsoil and seeded.

5.0 COST ESTIMATE

Cost estimates are presented for ion exchange and two chemical treatment systems. The costs included are for capital equipment, transportation and disposal, maintenance, personnel, utilities, and chemical costs. The cost of an insulated steel building is also included. The size and cost of the building will vary depending on the required floor space. Cost for an RO system will not be considered, while the cost for a RCRA variance is negligible. The support costs for draining the on-site pond, scraping the contaminated soils, analyzing 10 soil samples, and seeding the site will be considered separately.

SUPPORT COSTS

Redacted-Information not relevant to site remedy selection.

Equipment	Days	Costs
1 Front End Loader @ $480.57/Day	3	$1,441.71

Equipment Continued	Days	Costs
1 Pickup (3/4 Ton) @ $48.96/Day	3	146.88
1 Passenger Sedan @ $60/Day	3	180.00
	Subtotal	$1,768.59

Materials		Costs
Extent Of Contamination 10 Samples @ $300/Sample		$3,000.00
4" Topsoil Over 1 Acre 532 yd^3 of soil @ $5/$yd^3$ delivered		2,660.00
Fill For Pond 20 ft X 20 ft X 4 ft 593 yd^3 of Soil @ $5/$yd^3$ Delivered		2,965.00
Seeding		1,000.00
PPE 2 @ $85.20/Day	3	511.20
16.1% G & A		1,631.93
	Subtotal	$11,768.13

Disposal		Costs
30 cu. Yds of Soil @ $150.00/yd		$4,500.00
2.0% G & A		90.00
	Subtotal	$4,590.00

Transportation		Costs
210 Miles @ $4.00/Loaded Mile		$840.00
2.0% G & A		16.80
	Subtotal	$856.80

Analytical		Costs
10 Samples @ $200.00/Sample		$2,000.00
2.0% G & A		40.00
	Subtotal	$2,040.00

Support Costs Summary

Item	Costs
Personnel	$ 4,564.83
Equipment	1,768.59
Materials	11,768.13
Disposal	4,590.00
Transportation	856.80
Analytical	2,040.00
Total	$25,588.35

Ion Exchange

Item	Costs
2-6,000 Gallon Storage Tanks	$ 5,000.00
15 ft X 15 ft X 10 ft Building Including Foundation	20,000.00
Transportation (59 loads) 300 Miles @ $4/mile	70,800.00
Disposal of 292,000 gal/yr. @ $0.35/gal	102,200.00
Fixed Equipment, Engineering & Training	50,000.00
Resin Costs $50/Week	2,600.00
Maintenance Personnel $20/Hour @ 4 hrs/Week	4,160.00
Utilities $20/Week	1,040.00
Installation Costs	1,884.00
Ion Exchange Total	$257,684.00 or $258,000.00

Annual Costs $181,000.00

Chemical Treatment With Filter Press

Item	Costs
Rolloff Box	$ 3,000.00
20 ft x 30 ft x 16 ft Building including Foundation	37,000.00
Transportation (1 Load) 300 Miles @ $4/Loaded Mile	1,200.00
Disposal 15 Tons/yd @ $127/Ton	1,905.00
Fixed Equipment, Engineering, & Training	100,000.00
Chemicals $50/Week	2,600.00
Maintenance Personnel $20/Hour @ 8 Hours/Week	8,320.00
Utilities $50/Week	2,600.00
Installation Costs	6,150.51
Chemical Treatment With Filter Press Total	$162,775.51 or $163,000.00
Annual Costs	$17,000.00

Chemical Treatment With Sludge Dryer Item	Costs
Rolloff Box	$ 3,000.00
15 ft x 30 ft x 12 ft Building Including Foundation	25,000.00
Transportation (1 Load) 300 Miles @ $4/Loaded Mile	1,200.00
Disposal 15 Tons/year @ $127/Ton	1,905.00
Fixed Equipment, Engineering & Training	49,000.00
Chemicals $50/Week	2,600.00
Maintenance Personnel $20/Hour @ 8 Hours/Week	8,320.00
Utilities $100/Week	5,200.00
Installation Costs	6,150.51
Chemical Treatment With Sludge Dryer Total	$102,375.51 or $103,000.00
Annual Cost	$20,000.00

BETTER BRITE CHROME
CLEANUP COST ESTIMATE SUMMARY

Clean-Up Contractor Costs			
Support Costs Total	$ 25,588.35		
Capital Cost of Chemical Treatment System W/Sludge dryer	102,375.51		
20 % Contingency	25,592.77		
Subtotal		$153,556.63	
TAT Costs			

Redacted information not relevant to selection of removal action

Subtotal		$164,556.63	
15% Contingency		$24,685.50	
Extramural Costs			$189,240.13
U.S.EPA Costs 100 Hours @ $91.00/Hour	$ 9,100.00		
PROJECT TOTAL			$198,340.13
			or $199,000.00

ATTACHMENT A

Aqua Treat, Inc. — *Industrial Water Pollution Control*

USER'S LIST

SOUTHWEST AUTO RADIATOR OAK LAWN, ILLINOIS	300 gallon batch system, cleaning up radiator shop wastewaters.
WALTZ BROS. INC. WHEELING, ILLINOIS	200 gallon batch system, cleaning up spent coolant and wash wastewaters.
HANSEN-STERLING DRUM, CO. CHICAGO, ILLINOIS	20 gpm continuous recycle/pressurized dissolved air flotation modified to a dissolved air flotation system and full flow 40 gpm continuous.
J & J AUTO RADIATOR CHICAGO, ILLINOIS	300 gallon batch system, cleaning up radiator shop and wash wastewater complete with sludge treatment and drying unit.
OUISIANA GRAVURE CYL. SERV. WEST MONROE, LOUISIANA	500 gallon batch system, cleaning up plating and wash wastewaters.
KEYSTONE GRAVURE CYL. SERV. LANSDALE, PENNSYLVANIA	250 gallon batch system, cleaning up plating and wash wastewaters.
PIEDMONT GRAVURE CYL. SERV. DURHAM, NORTH CAROLINA	4000 gallon batch system, modified to a dissolved air flotation unit.
GILBRETH INTERNATIONAL CORP. BENSALEM, PENNSYLVANIA	1000 gallon batch system, cleaning up plating and wash wastewaters complete with a sludge treatment and drying unit.
NORTHEASTERN GRAVURE SERV. SARATOGA SPRINGS, NEW YORK	250 gallon batch system, cleaning up plating and wash wastewaters.
EX RADIATOR & WELDING, INC. CHICAGO, ILLINOIS	1000 gallon batch system, cleaning up radiator and wash wastewater complete with a sludge treatment and drying unit.
GILBRETH INTERNATIONAL CORP. BRISTOL, PENNSYLVANIA	1000 gallon batch system, cleaning up plating and wash wastewaters complete with a sludge treatment and drying unit.
INDIANA RADIATOR SHOP, INC. EAST CHICAGO, INDIANA	10/20 gallon continuous, cleaning up radiator shop and wash wastewaters complete with a sludge treatment and drying unit.
J. L. FEW ASSOCIATES, INC. NOBLESVILLE, INDIANA	150 gallon batch module, cleaning up spent coolant and wash wastewaters complete with sludge treatment and drying.
REX RADIATOR & WELDING, INC. BENSENVILLE, ILLINOIS Steve Rex 42/-1531	500 gallon batch module, cleaning up radiator shop and wash wastewater complete with sludge treatment and drying.

7-1-88

Office: P.O. Box 702 • Chicago Heights, IL 60411 • (312) 756-3129
Plant: Van Siding Road • Kankakee, IL 60901 • (315) 932-3015

Aqua Treat, Inc. — Industrial Water Pollution Control

TERMS AND CONDITIONS OF SALE

ORDER ACCEPTANCE:
No contract to furnish the goods, services or equipment described herein shall be deemed to exist unless and until the Purchaser's order is received and approved by AQUA-TREAT Credit Department and acceptance is confirmed in writing by an authorized representative of AQUA-TREAT, INC.

TERMS OF PAYMENT:
Thirty per-cent (30%) of the price shall be paid within ten (10) days after this contract has been accepted by both parties. Sixty per-cent (60%) of the price shall be paid upon delivery of equipment to the site. Ten per-cent (10%) of the price shall be paid upon start-up of installed system.

DELIVERY:
All quoted shipping dates are approximate only. In event of delay, AQUA-TREAT shall not be liable for any penalties, charges or damages for failure to meet such dates.
Delivery shall be made F.O.B. point of manufacture unless otherwise stated on the face hereof.
AQUA-TREAT shall not be liable for loss, damage or shortage occurring during transit. The Purchaser shall report to the carrier all claims for loss, damage or shortage occurring during transit and file all claims related thereto.

TAXES:
AQUA-TREAT's price for the goods, services or equipment described herein does not include any allowance for Federal, State or Local sales or user taxes, gross receipts, gross income or other taxes now in effect or hereafter enacted; and determined to be applicable to the sale by AQUA-TREAT, the purchase by the Purchaser or delivery by AQUA-TREAT to the Purchaser. Such taxes shall be for the account of the Purchaser and shall be paid by the Purchaser either to AQUA-TREAT or to the appropriate government authority as law requires. Taxes payable by AQUA-TREAT on it's net income, corporate franchise or capital stock are excluded from this provision.

WARRANTY:
AQUA-TREAT warrants that the goods, services or equipment furnished pursuant hereto will; one (1) conform to the approved or recorded drawings if any; two (2) be of good workmanship, and quality; three(3) be free from defects in material and workmanship, provided it has had normal use and used in accordance with manufacturer's instructions, for a period of 12 months from the date of start-up or 18 months from date of shipment, whichever occurs first. In the event that any defects in material and/or workmanship are detected within the specified period, AQUA-TREAT's obligation under this warranty is limited to furnishing a replacement part F.O.A. factory. Labor of installation shall be the obligation of others. AQUA-TREAT shall be given the opportunity to inspect such alleged defects prior to taking any action. Components purchased by AQUA-TREAT shall be limited to the usual guarantee or warranty extended by the manufacturer or supplier of such components.

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Office: P.O. Box 702 • Chicago Heights, IL 60411 • (312) 756-3129
Plant: Van Siding Road • Kankakee, IL 60901 • (315) 932-3015

WARRANTY CONTINUED:

AQUA-TREAT MAKES NO WARRANTY OF MERCHANTABILITY NOR ANY OTHER WARRANTY, EXPRESS OR IMPLIED, EXCEPT AS STATED ABOVE. IT IS ALSO UNDERSTOOD AND AGREED THAT PURCHASER WILL MAKE NO CLAIM AGAINST AQUA-TREAT FOR SPECIAL, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES ARISING OUT OF OR RELATED TO THE USE AND OPERATION OF THE EQUIPMENT FURNISHED HEREUNDER.

DESIGN AND CONSTRUCTION:
AQUA-TREAT reserves the right to make such changes in details of design, arrangement or manufacture as shall, in AQUA-TREAT's judgment, constitute improvement.
AQUA-TREAT reserves the right to furnish substitute materials or components for materials or components which cannot reasonably be obtained because of restrictions imposed by or in connection with government authority. AQUA-TREAT assumes no responsibility for installation of equipment or parts that are shipped unmounted.

CHANGE ORDERS:
Any change of an order must in writing from our customer. Changes of an order involving custom-built equipment, after a formal acknowledgement has been made by our home office, are subject to a $200.00 list price addition for each different model. Added costs may be assessed for changes which necessitate new engineering and/or wiring drawings.

CANCELLATIONS:
Cancellations after the home office acknowledges receipt of order are subject to reasonable charges determined by AQUA-TREAT based upon expenses incurred and commitments made to AQUA-TREAT's suppliers.

GENERAL:
It is understood and agreed that there are no other understandings or agreements relative to this order except those set forth above and on the face hereof, and any conditions proposed by the Purchaser shall be deemed to have been superseded by the conditions set forth herein.

AQUA-TREAT, INC.